REMARKS

Summary: By this Amendment and Response, the Amendment and Response dated 9/10/02 has been edited and re-presented conforming to present practice, including (i) a complete listing of claims 1 – 17 with status identifiers; and (ii) amendment markings in amended claims 1, 6, 7, and 9-12. Other changes have been made to comply with paragraph 5 of the Notice. Approval of the format of these amendments is respectfully requested. Per amendments originally filed in 2002, the specification has been amended to correct typographical errors, and to properly refer to the FIGs. A Separate Letter to the Official Draftsperson responds to the original drawing rejection, and the sheets enclosed with the Letter are marked with "Replacement Sheet". Also, formal drawings sheets for FIGs. 4B, 5B-1, 5A-2, and 32 are submitted as replacement sheets, and amendments are noted in the Letter. Having received on July 30, 2007, an Office Action dated 7/6/07, in a Chinese patent application corresponding to the captioned application, an Information Disclosure Statement is filed herewith, citing the one Japanese reference cited in the Chinese Office Action, and enclosing the Patent Abstract of Japan (and machine translation) in English for this Japanese reference. Claims 1, 6, 7, and 9-12 have been amended to clarify the claims and conform the text to antecedents. Claims 15-17 have been added to define certain aspects of Applicants' invention. Remarks are made for the patentability of the rejected claims.

Amendments To The Specification: Without adding new matter, the following amendments have been made. Pages 19, 22, 30, 31, 38, 40, 46, 51, 54, 57, 54, 57, 64, and 67 have been amended to correct obvious typographical errors. Page 21 has been amended to correct the Figures in which arrow 209H is shown. Page 28 has been amended to correct the Figures in which the structures 230 of the array 265 are shown. Page 31 has also been amended to correct the Figures in which structure of the motor 290 is shown, and to properly refer to the fluid 293 as being shown in FIG. 8, and to refer to an inlet for such fluid 293. Page 48 has

been amended to delete a reference to an arrow not shown in Figure 1B. Page 83, has been amended to correct a typographical error in paragraph 11 of Appendix B. The correction conforms to paragraph 14 of Appendix B, thus no new matter is added. Entry of these amendments is respectfully requested.

Amendments To The Claims: Claims 1, 6, 7, and 9-12 have been amended to clarify the claims and conform text to antecedents. The claim 1 amendment conforms "areas" at line 8 to the "areas" defined at line 2. The claim 6 amendment conforms the uses of "force control processor" to the original recitation at line 14, and at line 16 refers to "values" of relative movement to conform to the plural "increments" of movement defined at lines 12 and 13. The amendment to claim 7 corrects the grammar as to the output signals. The amendments to claims 9 and 10 provide appropriate "wherein" clauses and related grammatical changes. The claim 11 amendments correct punctuation (line 5), antecedents (line 7), other force control processor antecedents, and the time in the last clause. The claim 12 amendments correct typographical errors at lines 3 and 9. Entry of these amendments is respectfully requested.

Response to Rejection of Apparatus Claims 1-5: Claims 1-5 were rejected under 35 U.S.C. 102 (a) a being unpatentable over Hayashi et al ("Hayashi") based on what Hayashi "implicitly discloses". In the rejection, Hayashi was cited at column 7, lines 49-59 for the teaching of a first processor programmed to provide pressure data. Also, Hayashi at column 6, line 59 to column 7, line 47 was cited for the teaching of a second processor programmed to process data representing relative movement for providing area data.

Discussion of Claim 1

Reconsideration of this rejection is respectfully requested. Initially, it is noted that claim 1 defines first and second processors, and defines specific programming of each of the first and second processors with respect to the data processed by each

separate processor. It is respectfully submitted that the claimed programming is part of the structure of the claimed apparatus by which processing capacity is not exceeded for critical operations of processing area data and pressure data (e.g., see the specification at page 74). Accordingly, the claimed programming should be given patentable weight.

It is respectfully submitted that there is no teaching in Hayashi, implicit or actual, of the two processors that are said to be "implicitly" (i.e., "impliedly") disclosed in Hayashi. In detail, the specifically disclosed (not implied) circuit 21 of Hayashi is only one processor. This is made clear at column 6, lines 47-48, which is a continuation of the description of Fig. 4 that starts at column 4, line 19. At lines 47-48 the control circuit 21 of Figure 4 is said to be "constructed by a computer, for example." Thus, the specific disclosure is of one computer.

Further, reference is made to the reference in the rejection to column 7, lines 49-59. While apparently intended to identify a disclosure of a separate processor, this portion of column 7 instead identifies a memory (see "store a relationship between..." at lines 48+). In more detail, at lines 51-54 it is clear that only the one computer (control circuit 21) calculates the contact area, and then that one computer calculates the load using pressure data. Moreover, that specific disclosure of the control circuit 21 does not state or imply that there is more than one computer. Thus, at columns 6 and 7 Hayashi teaches only one computer. Further, there is no teaching in Hayashi, nor any reason in Hayashi to believe, that more than the one disclosed computer performs all of the operations described by Hayashi at the cited lines at columns 6 and 7.

It is further submitted that Hayashi's additional disclosures of the circuit 21 do not indicate that the one circuit 21 is anything more than one computer. For example, see column 8, lines 66+ (circuit 21 reducing the load, no specifics of computer); column 9, lines 27-37 (table in memory, no specific disclosure of computer at lines 32-33); and

column 9, lines 45-48 (area calculated by circuit 21, no specific disclosure of computer at lines 45-47).

Further, Hayashi emphasizes providing a "definite" polishing pressure. In view of this, there is no reason in Hayashi to provide a separate processor, apart from the control circuit 21, to provide variable pressure data representing the pressure to be applied to the contact areas during polishing. Examples of where emphasis is placed on providing a "definite", i.e., constant, pressure include the following places in the Hayashi specification:

column 2, line 25 ("...polishing pressure can be constant...");

column 7, lines 44-47 ("...,polishing pressure P can be definite");

column 9, lines 9-12("...P can be definite");

column 9, line 36 (P is the definite ...pressure");

column 10, lines 61-67 (...P was caused to be definite);

column 11, lines 5 and lines 65-66; and

column 12, line 50.

Reference is also made to the Hayashi disclosure where there is discussion of non-definite polishing pressure. At column 10, lines 44-45, the polishing pressure P was raised "to a nonnegligible extent". The further discussion indicates that compensation for polishing cloth movement to produce constant polishing pressure is indispensable (column 10, lines 55-60). Thus, the provision in Hayashi of only one computer is consistent with a lack in Hayashi of a need to process variable polishing pressure, which Applicants identify as a source of overload of processing capacity, solved by Applicants' claimed first and second processors.

In review, it is respectfully submitted that:

Claim 1, and thus dependent claims 2-5, define two separate processors, each having structure defined by each processor's own defined programming; and

Hayashi fails to disclose or imply such claimed two separate processors, each having its own defined programming.

It is respectfully submitted that Hayashi does not anticipate claims 1-5.

Moreover, it is submitted that the differences between the one computer of the one control circuit 21 of Hayashi, and the claimed two processors with such programming, would not have been obvious under 35 USC Section 103. In detail, it is clear that Hayashi directly teaches one to use only one computer, which is a teaching away from using the two claimed processors with the claimed separately defined programming. It is submitted that when the reference teaches away from the claimed invention, the reference is not a proper basis for an obvious rejection.

In view of these remarks, it is submitted that claim 1, and dependent claims 2-5, are patentable over Hayashi, and allowance of these claims is respectfully requested.

Further Discussion of Dependent Claims 2-5

The rejection of Claims 2-5 further stated that:

> "...the apparatus of Fig. 4 performs all the functions ...set forth in claims 2-5 ...."the claims are directed to an apparatus which must be distinguished from the prior art in terms of structure rather than functions. Hence, the functional limitations which are narrative in form have not been given patentable weight, a functional recitation must be supported by recitation in the claims of sufficient structure to warrant the presence of the functional language".

Reconsideration of the statements concerning functional language in these claims is respectfully requested. Referring to claim 2, it is respectfully submitted that the second processor is further defined in terms of a characteristic that defines a structural limitation of a processor, namely "processing capacity". Moreover, the sufficiency of that capacity for real-time control is expressly defined in terms of values of variations of specific factors. The Examiner has not indicated how or why or what aspect of this limitation defining this characteristic is "functional", nor why any aspect of this characteristic is functional.

Referring to claims 3-5, it is respectfully submitted that the first and second processors are further defined in terms that define the programming of these processors. This programming defines structural limitations of the processor, namely what type of data is processed and what type of data is output. The Examiner has not indicated how or why or what aspect of these programming limitations are not structural, nor why any aspect of these limitations are functional.

It is further respectfully submitted that even if claims 2-5 were properly said to define only functional limitations, such limitations must be taken into consideration in a patentability determination. The Examiner stated that:

> "...the functional limitations which are narrative in form have not been given patentable weight, a functional recitation must be supported by recitation in the claim of sufficient structure to warrant the presence of the functional language. "

It is respectfully requested that in the determination of patentability, full weight be given to the statements recited in claims 2-5, whether or not such statements recite "functional" features of the defined processors of the apparatus. In support of this request, reference is made to K-2 Corp. v. Salomon, S.A., 52 USPQ2d 1001 (Fed. Cir. 1999). There, the phrase

"for substantially preventing movement therebetween at least in a horizontal plane"

was interpreted by the CAFC. The CAFC characterized such phrase as "functional language". However, in stating that such "functional language is, of course, an additional limitation of the claim", the CAFC clearly recognized that patentable weight must be given to the language. Further, the CAFC referred to the Wright Med. Tech., Inc. v. Osteonics Corp. case, 43 USPQ2d 1837 (Fed. Cir. 1997) with approval and noted that in Wright, "functional language" was "analyzed as a claim limitation".

In view of the above remarks, it is respectfully submitted that in claims 2-5, each entire limitation recited in each claim is properly given weight in determining patentablity. When such weight is given to such limitations for patentability purposes, it is respectfully submitted that these claims further distinguish over Hayashi. For example, whereas the Examiner asserted that the apparatus of Fig. 4 performs all the functions set forth in claims 2-5, the above remarks make it clear that Fig. 4 does not show two computers, thus Hayashi does not define the processing capacity of a second processor (claim 2). Also, Hayashi does not define first and second processors, in which only the defined processing of claim 3 is performed by the second processor. Another example is the programming defined in claim 5 to process the defined sequential data. Accordingly, in view of the features set forth in claims 2-5, there is further reason to allow claims 2-5, which action is respectfully requested.

Response to Rejection of Method Claims 12-14: Claims 12-14 were rejected under 35 U.S.C. 102 (a) as being unpatentable over Hayashi. In stating the rejection of the method claims, the Examiner also cited Hayashi at column 7, lines 49-59 for the teaching of a first processor programmed to provide pressure data, and cited Hayashi at column 6, line 59 to column 7, line 47 for the teaching of a second processor programmed to process data representing relative movement for providing area data.

Discussion of Claim 12

Reconsideration of this rejection is respectfully requested. Initially, it is noted that claim 12 defines a method of controlling pressure, in which there is an operation of providing a first processor and an operation of providing a second processor. Claim 12 defines the characteristics of the first and second processors in terms of the respective data that is processed. The processing of the specified data is an integral part of the definitions of the operations of the method by which the processing capacity of the processors is not exceeded, as described above.

It is respectfully submitted that there is no teaching in Hayashi of a method in which there is providing of two processors. In detail, by providing only the one circuit 21, Hayashi only provides one processor (column 6, lines 47-48, control circuit 21 is "constructed by a computer, for example.") As submitted above, the referenced Hayashi disclosure at column 7, lines 49-59 provides a memory (line 50), and no second processor is disclosed or implied. In detail, it is clear from lines 51-54 that only the one control circuit 21 calculates the contact area, and then that one computer calculates the load using pressure data. Thus, providing of only one computer is taught by Hayashi, and that one computer performs all of the operations described by Hayashi at the cited lines at columns 6 and 7.

Further, as described above, given a goal of Hayashi to provide a constant pressure, in Hayashi there is not only no disclosure or implication of providing a second processor, there is no reason to have an operation of providing a separate processor, apart from the control circuit 21, to provide pressure data representing the pressure to be applied to the contact areas during polishing.

Because claim 12 defines operations of providing two separate processors, each

having its own defined processing of data, and because Hayashi fails to disclose or imply the providing of such claimed two separate processors, each having its own defined data processing, it is submitted that Hayashi does not anticipate claim 12.

Moreover, it is submitted that the differences between a method of providing the one computer 21 of Hayashi and the claimed method of providing of two processors with the defined processing, would not have been obvious under 35 USC Section 103. In detail, it is clear that Hayashi directly teaches one to provide only one computer, which is a teaching away from providing the two claimed processors with the claimed processing. It is submitted that when the reference teaches away from the claimed invention, the reference is not a proper basis for an obvious rejection.

In view of these remarks, it is submitted that claim 12 is patentable over Hayashi, and allowance of claim 12 is respectfully requested.

Discussion of Claims 13-14

Claims 13-14 were rejected with the further comment that:

> "...the apparatus of Fig. 4 performs all the functions and steps set forth in claims 2-5 and 12-14...the claims are directed to an apparatus which must be distinguished from the prior art in terms of structure rather than functions. Hence, the functional limitations which are narrative in form have not been given patentable weight, a functional recitation must be supported by recitation in the claims of sufficient structure to warrant the presence of the functional language".

Initially, in response to the rejection, reconsideration of the statements concerning functional language in these claims is respectfully requested. Referring to claim 13, it is

respectfully submitted that the method is defined in terms of text that defines operations of the method, and not functions of apparatus. In detail, the first operation is

> characterizing steps of the chemical mechanical polishing operations according to the available processing capacity required for real-time processing of the steps at a rate sufficient for controlling the pressure to be applied to the contact areas of the wafer and of the polishing pad during the chemical mechanical polishing operations, the characterizing being with respect to at least one of the following characteristics of the steps:

The specific characteristics related to the characterizing are then defined. Further, the second operation is

> determining a value of the available processing capacity required for the real-time processing of the step data necessary to control the pressure to be applied to the contact areas of the wafer and of the polishing pad in the step of the chemical mechanical polishing operations.

Claim 14, based on claim 13, further defines the data processing referenced in the preamble of claim 13, and defines a "dedicated processor" with respect to which the "determining" operation is performed. This definition of the dedicated processor is in terms of the only types of data that are processed by the dedicated processor. It is respectfully submitted that the specification of a limited number of types of data that are processed is not a functional limitation, but is instead a specification of a characteristic of the dedicated processor. Accordingly, it is respectfully requested that weight be given to the operations defined in claims 13-14 in determining patentability. Similarly, new claims 15-17 define respective two, three and four characteristics with respect to which the characterizing and determining operations of claim 13 are performed, and thus also specify characteristics of the operations of the process and not functions of an apparatus.

As to the patentability of claims 13-17, it is respectfully submitted that Hayashi does not teach that the apparatus of Fig. 4 performs all (or any of) the operations set forth in claims 13-17. The operations Hayashi attributes to the circuit 21 in Fig. 4 are set forth on column 6, lines 19-58. There, the control circuit 21 is said to control the load, the rocking section 18, the motor, and the pump 20. Additionally, further on column 6 through column 9 reference is made to FIGs. 5A-5C, and 6A-6C, which describe conversion of displacement to area, and area and pressure to load (see columns 7, lines 17+; 35+; 55+, for example).

It is respectfully submitted that Hayashi does not teach any of the claimed operations of a method of determining a value of available processing capacity of a processor used for pressure control in CMP operations. In detail, it is submitted that no mention is made at columns 6-9 of any way of determining a value of available processing capacity of the circuit 21, for example, which is the one processor disclosed by Hayashi. Further, it is respectfully submitted that none of the four characteristics defined in claim 13 is described by Hayashi in respect to characterizing CMP operations according to available processing capacity required for real-time processing of the CMP step. For example, as to the claimed "rate of relative movement" defined in claim 13, the Hayashi rocking speed described at column 12, line 49 is not related by Hayashi to available processing capacity required for such real-time processing by the circuit 21. As a further example, the problematic unevenness of the polishing described by Hayashi at column 11, lines 1-25 is not attributed to lack of available processing capacity of the circuit 21, but to variations in the polishing pressure (lines 19-20) and to polishing rate increase (lines 20-21). It is believed clear, then, that Hayashi does not teach all of the method operations recited in claims 13-17, such that these claims are patentable under 35 U.S.C. 102 (a) over Hayashi.

Moreover, it is submitted that the differences between the Hayashi description of its pressure control operations, and the claimed method of determining a value of available processing capacity for CMP operations, would not have been obvious under the standard in 35 U.S.C. 103. Hayashi notes problems in CMP polishing, but does not teach Applicants' claimed solutions that relate to determining a value of available processing capacity for CMP operations. For example, although Hayashi directly teaches a solution to the relative polishing rate of the central area (described on column 11, lines 1+), that solution is not the claimed solution of claims 13-17. Instead of determining a value of available processing capacity for CMP operations, as claimed, Hayashi uses the one disclosed processor of circuit 21 and (column 11, lines 26-39) cuts out the polishing cloth to provide an elliptic cloth (line 31). Further, in various descriptions of other solutions to CMP problems, Hayashi teaches use of different polishing cloths (column 15, lines 38 and 44). Finally, the summary at column 16, lines 8-20 does not even suggest that CMP operational problems may be solved by a method of first determining a value of available processing capacity for CMP operations to be performed by a processor.

Rather, the specific teachings of Hayashi noted above are teachings away from the claimed determining a value of available processing capacity for CMP operations to be performed by a processor. It is submitted that when the reference teaches away from the claimed invention, the reference is not a proper basis for an obvious rejection. Still further, as to claim 14, although the Hayashi circuit 21 processes three types of data, since there is no operation in Hayashi corresponding to the claimed "determining" operation, and Hayashi does not teach performing such a "determining" operation with respect to three specific types of data.

In view of these remarks, allowance of claims 13-17 is believed to be in order, which action is respectfully requested.

Response to Rejection of Claims 6-7, and 11: Claims 6-7, and 11 were rejected under 35 U.S.C. 103 (a) as being unpatentable over Hayashi in view of Sandhu et al. '129 ("Sandhu"). In stating the rejection Hayashi was applied as discussed above, and it was acknowledged that Hayashi does not disclose a feedback circuit for providing output signals representing increments of the relative movement. Sandhu was cited as to Fig. 1, and column 6, line 54 to column 7, line 30, for disclosure a polish control system which adjusts in situ the platen velocity and/or the individual localized pressures applied to the wafer to change the polishing rates of the individual regions of the wafer. In respect to Sandhu the two-way arrows shown in Fig. 4 were said to represent feedback circuit (column 7, lines 25-30 were referenced) to provide in-situ adjustments of operational parameters such as platen speed, slurry composition/flow rate, and polishing pressures to achieve desired polishing uniformity and rates. The rationale for the combination of Hayashi and Sandhu was said to be obviousness to modify the Hayashi polishing apparatus with a Sandhu-taught feedback circuit to provide the noted in-situ adjustments to achieve desired polishing uniformity and rates.

It is respectfully submitted that the combination of Hayashi and Sandhu would not result in the claimed invention. First, the rejection does not recognize that neither reference teaches or suggests the use of two separate processors in pressure control for CMP.

The discussion of Hayashi in Office Action Paragraph 4 merely referred to the discussion of Hayashi in Office Action Paragraph 2. However, as set forth in detail in the above remarks responsive to such Paragraph 2, Paragraph 2 fails to acknowledge that Hayashi teaches use of only one control circuit 21, and that such circuit 21 has only one computer. As is clear from the above remarks, despite the Examiner's Paragraph 2 statement that Hayashi "implicitly" discloses first and second processors, the actual Hayashi disclosure is that the control circuit 21 "is constructed by a computer, for example." It is not seen how Hayashi implies the teaching of two computers in view of this express teaching of one

computer. Further, the fact that Hayashi repeatedly refers to the tasks performed by that one circuit 21 (computer) negates any implication that more than one computer is used.

Further, in Sandhu the controller 72 is used to interface with only one processor, 74. For example, the description at column 6, lines 58-62 makes it clear that all of the "parameters are input to processor 74", and that such one processor 74 determines a set of desired operational parameters. Thus, in Sandhu there is no appreciation of Applicants' teachings that for real-time operations it is necessary to separate the processing into one (central) processor for specifying relative movement and pressure data, and a separate processor for processing such movement and pressure data to provide contact area data and data defining the force to be applied for polishing. Sanhu Figs. 1 and 2 clearly show the one processor 74, and no Sanhu description of that one processor 74 indicates that processing operations are separately performed by a second processor, such as the claimed force control processor. Moreover, the feedback noted by the Examiner (two-way arrows in Fig. 4) is supplied to an application controller 108, and not to a claimed force control processor. Further, the feedback shown in Fig. 1 is not to and from the processor 74, as claimed with respect to the force control processor, but is to and from the system controller 72. Importantly, in each case in which Sandhu uses feedback, the data fedback is applied to only one and the same processor 72, and not to separate central and force control processors.

Here, in review, neither reference teaches the important claimed concept of use of the two separate processors, which facilitates provision of processing capacity for the critical machine control processing described in Applicants' specification at page 75, for example. As a further indication that the combination is not proper, in view of the single processor in each of the combined references, and the lack therein of any disclosure of disadvantages of the sole processor structure, it is respectfully submitted that it would be contrary to the specific teachings of these references to provide the claimed second (force control) processor. In detail, rather than providing a basis for combination, it is submitted that these teachings of the references are evidence against the claimed separate processors

and their separate operations. In this regard, the CAFC found in Mitsubishi Electric Corp. v Ampex Corp. (8/30/99, CAFC case No. 97-1502) that a jury was properly instructed by an instruction that included

> "you may not combine the features of prior art products where the prior art itself teaches against the combination".

For this additional reason, allowance of claims 6, 7 and 11 is respectfully requested.

As a still further reason that the combination is not proper, it is submitted that the claimed apparatus would only result from the impermissible hindsight use of Applicants' claims 6, 7 and 11 as a framework. For example, such framework as taught only by Applicants is the claimed separation of the processing by use of the central processor for certain processing, and the use of the force control processor separate from the central processor and responsive to pressure data and the defined output signals (relative movement of wafer and pad) to process two defined programs. Similarly, for example, only Applicants teach a force control processor separate from a central processor (claims 6 and 11), wherein the separate force control processor provides force data in two stages (claim 7) or converts position data to area data, and the area data with pressure data to force data. Neither reference appreciates the basis for the claimed separation of processing, which facilitates provision of processing capacity for Applicants' critical machine control processing.

In view of these additional reasons, allowance of claims 6, 7 and 11 is respectfully requested.

Allowable Subject Matter: Appreciation is expressed for the indication in Paragraph 5 that claims 8-10 would be allowable if written in independent form including all of the limitations of the base claim and any intervening claims. Applicants respectfully request leave to defer such rewriting until after the Examiner's review of the foregoing arguments. However, Applicants respectfully request approval of the amendments proposed to claims 9 and 10, which clarify these claims and do not expand the scope thereof. For example, claims 9 and

10 provide clarity by setting forth proper "wherein" clauses, and in claim 10 the last recitation of "force control processor" conforms to the antecedent.

In view of these remarks and amendments, it is believed that this Application is in condition for allowance, which action is respectfully requested.

Respectfully submitted,
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